

Hydrodynamic and Hydrologic Feasibility Assessment - Chinook River Restoration Project

Tarang Khangaonkar*, Stephen Breithaupt, Liza Roy, Felix Kristanovich, and
Zhaoqing Yang

Foster Wheeler Environmental Corporation
Water Resources Program
12100 NE 195th Street
Bothell, WA 98011
(425) 482-7833, tkhangaonkar@fwenc.com

*in association with
John Axford of Ducks Unlimited, Inc. and Robert Warren of Sea Resources*

Abstract

A hydrodynamic and hydrologic modeling analysis was conducted to evaluate the feasibility of restoring natural estuarine habitats in the Chinook River estuary, located near the mouth of the Columbia River in Washington state. Prior to development, a 1,500-acre expanse of tidal marshes, complex networks of dendritic tidal channels, and peripheral tidal swamps characterized the estuary. The estuary likely provided important rearing habitat for juvenile salmonids originating from the Chinook River as well as the greater Columbia River Basin. Recent monitoring indicates that the abundance of salmonid species native to the Chinook River watershed has been significantly reduced from historic levels. One of the primary factors of this reduction is attributable to the construction in the early 1920s of a Highway 101 (Hwy 101) overpass across the mouth of the Chinook River and a tide gate under the overpass. This construction, which was designed to eliminate tidal action in the estuary, has impeded the upstream passage of salmonids and removed physical processes that formed and maintained productive estuarine habitats. The goal of the Chinook River Restoration Project is to restore tidal functions through the estuary, by removing the tide gate at the mouth of the river, filling drainage ditches, restoring tidal swales, and reforesting riparian areas.

Hydrologic and hydrodynamic models of the Chinook River estuary were developed to provide baseline information for the restoration project and to evaluate and design a restoration alternative that would best meet the project goal while also providing flood protection to properties upstream of Chinook River Valley Road. The hydrologic model (HEC-HMS) computed Chinook River and tributary inflows for use as input to the hydrodynamic model at the project area boundary. Oregon Graduate Institute of Science

and Technology's existing hydrodynamic model of the Columbia River estuary was used to develop the tidal boundary conditions in Baker Bay for the hydrodynamic model. The hydrodynamic model (RMA-10) was used to generate information on water levels, velocities, salinity, and inundation during both normal tides and 100-year storm conditions under existing conditions and under the restoration alternatives.

The major conclusion of the hydrologic and hydrodynamic modeling study is that restoration of the tidal functions in the Chinook River estuary would be feasible through opening or removal of the tide gate. Implementation of the preferred alternative (removal of the tide gate, restoration of the channel under Hwy 101 to a 200-foot width, and construction of an internal levee inside the project area) would provide the required restorations benefits (inundation, habitat, velocities, and salinity penetration, etc.) and meet flood protection requirements. In addition, relatively little difference in the drainage or inundation upstream of Chinook River Valley Road would occur as a result of the proposed restoration activities.